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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002952076 for a patent by OWEN KEITH HUTCHISON as filed on 16 October 2002.

I further certify that the above application is now proceeding in the name of INNOVATIVE MOTORCYCLE TECHNOLOGY PTY. LTD pursuant to the provisions of Section 113 of the Patents Act 1990.

WITNESS my hand this
Eleventh day of August 2003

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

Australia
Patents Act 1990

Provisional Specification
Provisional Patent

Combined Clutch and Brake Actuator With Bias and Freeplay Takeup

The invention is described in the following statement:

Combined Clutch and Brake Actuator with Bias and Freeplay Takeup

Description

This invention is intended to improve the controllability of motorised vehicles fitted with a hand operated clutch and a foot operated rear brake. It came about as a result of difficulties I had in operating the rear brake pedal of a motorcycle whilst negotiating difficult terrain. As your hands are always on the handlebars the underlying principle is that as many controls as possible should be hand operated.

The following invention is based on that principle, by bringing rear brake controls that are normally foot operated into a hand control and combining it with the clutch control in a manner that improves the safety of the vehicle.
A single lever, finger operated, fitted to the handle bar of a motorised vehicle that via a series of mechanical linkages, operates the clutch or the rear brake or both.
Furthermore this lever is able to move in 2 or 3 planes with movement in at least one of these planes having the ability to alter the initiation point and or effectiveness of one or both of the clutch and brake functions. Movement in the other plane or planes generates the force required to operate these functions.

To assist in the understanding of the invention reference will now be made to the accompanying drawings. Please note that figure (1) shows the invention in a partial cross section form viewing overhead whilst on the vehicle. Figure (2) shows a partial cross section viewing from above from a position in front of the vehicle.
Due to the varied nature of the applications of the vehicles that this invention is intended for there are many possible ways of configuring and adjusting this invention to suit particular applications.
Some possible configurations are shown in chart (1).
To further assist in the understanding of the invention an example suitable for use on a Competition Trials Motorcycle is shown in Figures (1) and (2).
Referring to chart (1) this particular configuration is described by the following:

1. One lever operates both clutch and brake
2. Lever is designed for one finger use
3. Bias is achieved by side shift of lever
4. Left to right movement of lever biases towards brake function
5. Freeplay adjuster for brake, leverage adjuster arm for clutch.

Pulling lever (1) in towards handlebar (8) with lever (1) in direction (A) first operates the clutch master cylinder (9) by pivoting in an anticlockwise direction lever (2) around pivot (10). This pushes actuator rod (12) against clutch freeplay adjuster pin (13) which operates the clutch master cylinder. This rotation of lever (2) around pivot (10) also operates the brake actuator rod which takes up the freeplay in freeplay adjuster (15). After the freeplay is taken up then the brake cylinder actuation will commence. By changing the settings on the adjusters (15) and or (3) it is possible to overlap the clutch and brake functions or to have one function operational only.
Shifting the lever (1) in direction B pushes on clutch leverage adjuster (3) which rotates the clutch leverage arm (16) which shifts the clutch actuator rod (12) closer to pivot point (10) thus increasing the overall leverage of lever (1) in actuating the clutch master cylinder (9).
In addition to this, as the clutch actuating rod (12) moves closer to pivot point (10), the tip of the clutch actuating rod (12) is further away from the centre line of the master cylinder. This increases freeplay which is taken up by the clutch freeplay adjuster pin (13). As lever (1) shifts in direction B it also pushes on the brake freeplay adjuster (4) which pushes the brake freeplay pushrod (17) which takes up the freeplay in the brake freeplay adjuster (15).

Shifting lever (1) in direction B therefore has the following effects:

1. Increases leverage ratio to clutch
2. Introduces freeplay in clutch operation
3. Takes up freeplay in brake and can operate brake.

This means in operation that the operator has the ability to change the function of lever (1)'s inward travel, i.e towards the handlebar from the operation of the clutch to the operation of the brake by moving lever (1) in direction B. It can also be set up to operate both functions with overlap with rear brake bias if lever (1) is moved in direction B.

Other features shown in drawings are as follows:

1. Operators lever
2. Main lever
3. Clutch leverage adjuster
4. Brake freeplay adjuster
5. Fluid reservoir
6. Main bracket
7. Clutch leverage arm stop adjuster
8. Handlebar
9. Clutch master cylinder
10. Main pivot point
11. Operators lever pivot point
12. Clutch actuating rod
13. Clutch freeplay adjuster pin
14. Linear bush or bearing
15. Brake freeplay adjuster pin
16. Clutch leverage arm
17. Brake freeplay pushrod
18. Brake master cylinder
19. Operators lever travel adjusters
20. Adjustment for clutch actuation point.

Methods of achieving configurations described in chart (1):

w. The lever can be extended in direction A i.e lengthened, to accomodate more fingers if required.

x. A bias achieved by downward shift of the lever could be achieved by having lever (1) pivoted horizontally instead of vertically as shown in figure (1). Referring to figure (4), pushing down on the lever (1) operates the adjuster 3 and the adjuster 4. Please note that the downward motion of lever (1) will now pull on adjuster 3 thus rotating clutch leverage arm (16) in the opposite direction. This, if not desired can be rectified by having clutch leverage adjuster (3) pull on the clutch leverage arm (16) from a position on the clutch leverage arm (16) on the opposite side of it's pivot point i.e roughly where the lug is that the travel limiters (7) operates against.
Bias that is achieved by a combination of side and downward shift of the lever could be effected by having the same configuration as in figure (4) but replacing the pivot (11) with a spherical bearing that allows motion in both directions.

y. Left to right movement of the lever that bias's to clutch could be achieved by repositioning the pivot that joins the clutch leverage adjuster (3) to the clutch leverage arm (16) as described previously to reverse the rotation of clutch leverage arm (16). As well as the pivot that joins the brake freeplay adjuster (4) to the lever(1) could be shifted to a point roughly where the lug is that the levers travel stops (19) act upon. Attached from this point when lever (1) is pushed in direction B it will now pull on the brake freeplay adjuster (4). Downward movement of lever to bias to clutch function could be achieved by the same method of repositioning the pivot points to points where they move in the opposite direction.

z. Two x leverage arms describes a configuration whereby both the clutch and the brake use a system that varies the leverage ratio similar to that which is shown in figure (1) but the brakes also employs a leverage arm. It is envisaged that this arm would be configured to rotate in the opposite direction as the other one thus increasing the leverage to one function as the leverage is decreased to the other. However it would be possible to have both leverage arms rotating in the same direction.
Two x freeplay; simply 2 freeplay adjusters one for the clutch as well as the brake as shown used on the brake side of figure (1) and (2). Again as previously described these could be configured to increase freeplay simultaneously or to have one increasing freeplay whilst the other is decreasing freeplay.
Freeplay for clutch, leverage arm for brake could be achieved by simply swapping the clutch master cylinder with the brake master cylinder in Figure (1).

Other possible features to this invention could include a spring between lever (1) and lever (2) which may act in either direction depending upon the configuration used also tactile indication of when a function is about to be operated could be provided i.e the use of a ball, spring and detent.
It will be realised that the combined clutch and brake lever according to this invention is not restricted to the use of hydraulic cylinders as shown in the example, but may use other suitable forms of operating the clutch and brake. For example pneumatic, electric or any other means by which the brake and clutch can be effectively activated. It will be further realised the leverage ratios and hydraulic cylinders sizes shown are for example only and an individual vehicle may requirs re-positioning of pivot points, re-positioning of cylinders, changing of leverage ratios or cylinder sizes or the use of power assistance to increase efficiency.
Also note this invention does not limit itself to use of the freeplay adjuster system or leverage adjuster system shown but they are an example of how both freeplay could be taken up and how the leverage ratio can be changed respectively. For example freeplay could also be taken up by using a cam that is rotated by pushing lever (1) in direction B. This cam could then operate the brake freeplay pushrod.

I believe that this invention offers the following advantages over vehicles fitted with hand operated clutch and foot operated brakes.

1. Allows operator to utilise the rear brake whilst the operator's weight is placed at the extreme of it's mobility thus enhancing the controllability of the vehicle.
2. Allows the use of the vehicle by certain groups of disabled people
3. Simplifies the controls of the vehicle by virtue of the concept that a single lever is able to control the rotational speed of the rear wheel (within the constraints of gear selection and throttle setting)
4. Can be adjusted to help prevent rearward motion of the vehicle
5. Allows the operator's foot that would normally activate the rear brake to perform other functions i.e for dynamic or static stability, assistance for forward motion or for balance
6. Can be adjusted to help prevent stalling whilst using the rear brake of the vehicle
7. Allows the rear brake of the vehicle to be used without weight being transferred to the side of the vehicle that the rear brake pedal was on. This reduces the side loading on the front tyre whilst using the rear brake
8. Allows the redesign of the foot pegs to allow the rider to better shift his/her weight for and aft
9. By adjusting the overlap between the clutch and brake functions better control may be achieved over the retardation of the rotational speed of the rear wheel
10. Allows effective control of two functions i.e brake and clutch with one finger operated lever

Owen Hutchison 18th October 2002

Chart (1)

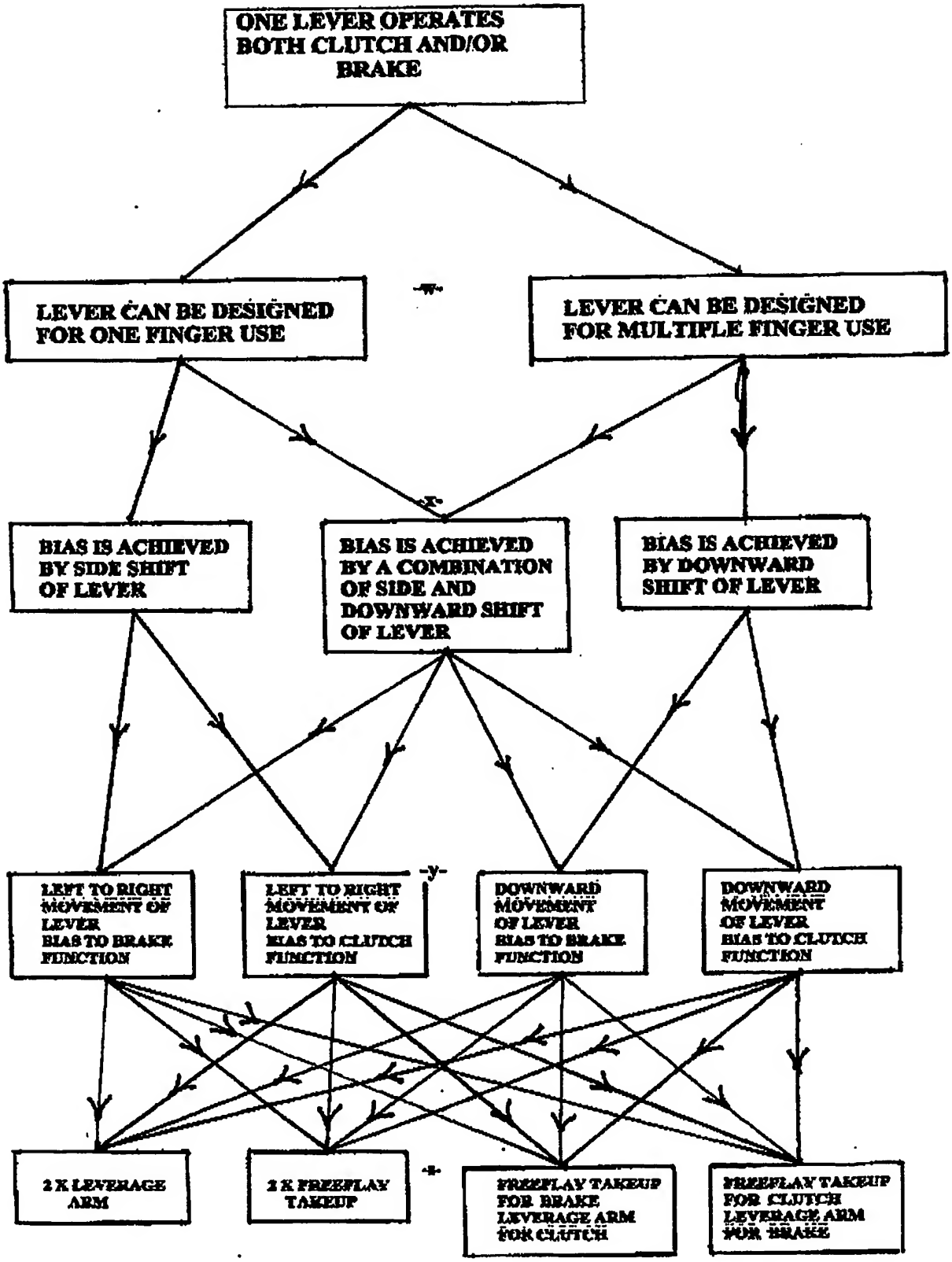
ONE LEVER OPERATES BOTH CLUTCH AND/OR BRAKE
LEVER CAN BE DESIGNED FOR ONE FINGER USE
-w-
LEVER CAN BE DESIGNED FOR MULTIPLE FINGER USE
-x-
BIAS IS ACHIEVED BY SIDE SHIFT OF LEVER
BIAS IS ACHIEVED BY A COMBINATION OF SIDE AND DOWNWARD SHIFT OF LEVER
BIAS IS ACHIEVED BY DOWNWARD SHIFT OF LEVER
-y-
LEFT TO RIGHT MOVEMENT OF LEVER BIAS TO BRAKE FUNCTION
LEFT TO RIGHT MOVEMENT OF LEVER BIAS TO CLUTCH FUNCTION
DOWNWARD MOVEMENT OF LEVER BIAS TO BRAKE FUNCTION
DOWNWARD MOVEMENT OF LEVER BIAS TO CLUTCH FUNCTION
-z-
2 X LEVERAGE ARM
2 X FREEFLAY TAKEUP
FREEFLAY TAKEUP FOR BRAKE LEVERAGE ARM FOR CLUTCH
FREEFLAY TAKEUP FOR CLUTCH LEVERAGE ARM FOR BRAKE

FIGURE 1

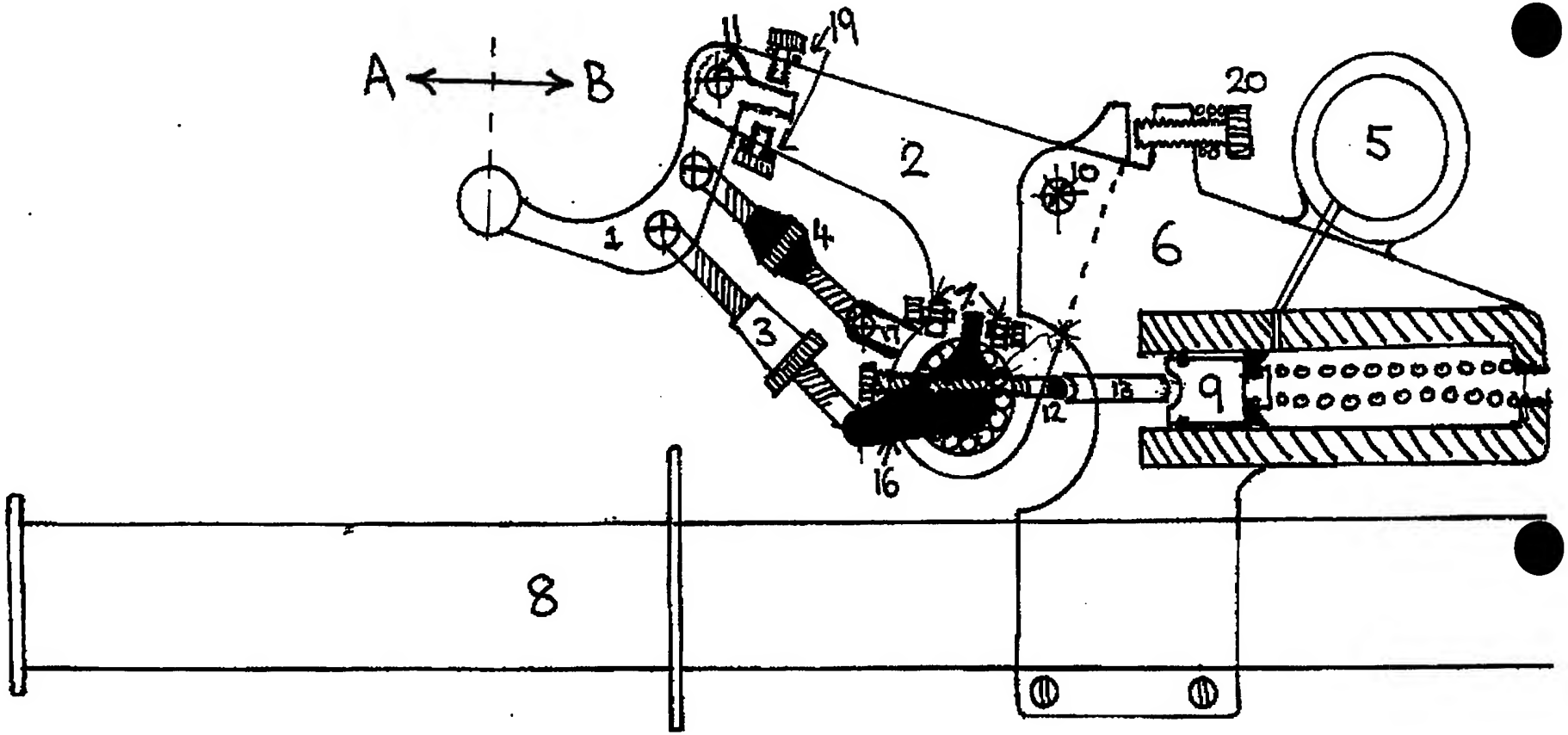

FIGURE 2

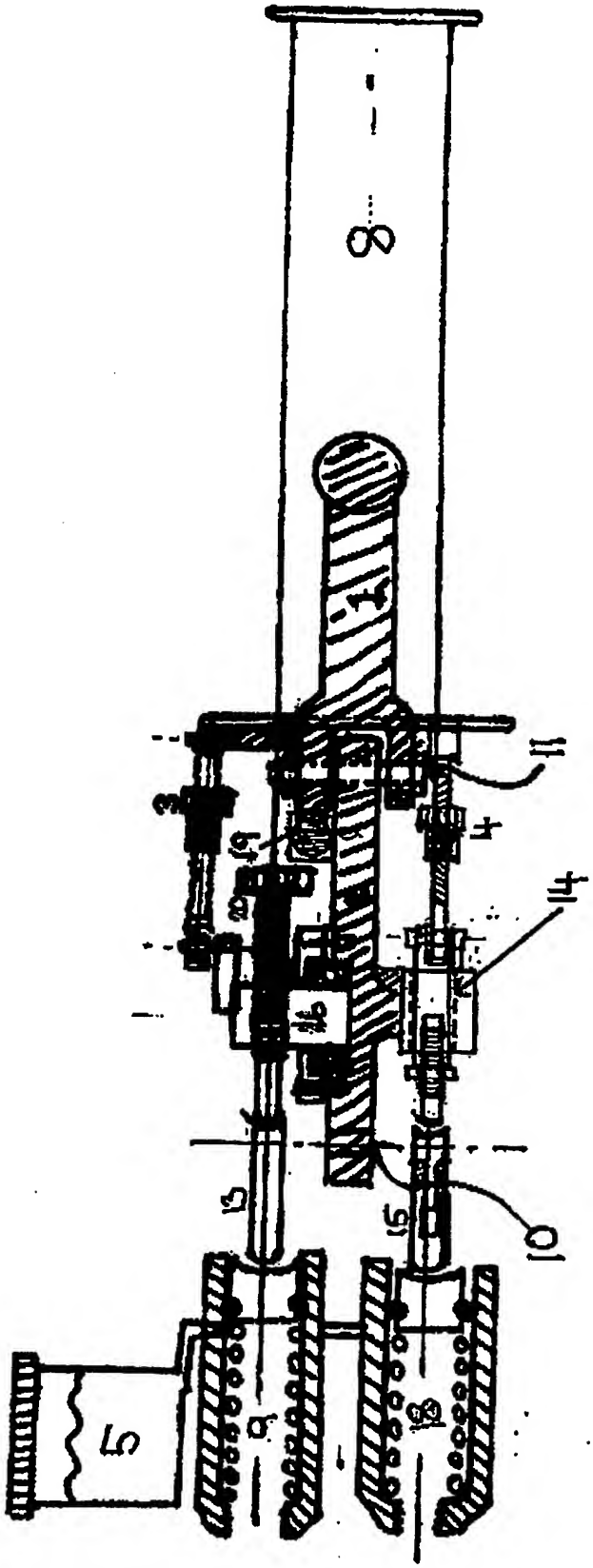

FIGURE 4